SRK INSTITUTE OF TECHNOLOGY VIJAYAWADA	**SRK INSTITUTE OF TECHNOLOGY** **Enikepadu, Vijayawada 521108** **Accredited by NAAC- A Grade** **DEPARTMENT OF MECHANICAL ENGINEERING**	**SRKIT / ME / 97**

TENTATIVE LESSON PLAN

Course/Code: MATERIALS SCIENCE & METALLURGY / R2022031

Year / Semester: II/II **Section:** I **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I Structure of Metals and Constitution of alloys & Equilibrium Diagrams **CO1:** Discover the crystalline structure of different metals and study the stability of phases in different alloy systems. **TB 1** - Introduction to Physical Metallurgy - Sidney H. Avener -McGrawHill			
	UNIT – 1 Structure of Metals and Constitution of alloys & Equilibrium Diagrams		
1	Bonds in Solids, Metallic bond	**From:** **30-01-2023** **To:** **27-02-2023**	Lecture interspersed with discussions, Student seminar
2	crystallization of metals, plane density		
3	Packing Factor - SC, BCC, FCC& HCP-line density		
4	Grain and grain boundaries		
5	Effect of grain boundaries on the Properties of metal / alloys, Hume Rotherys rules		
6	Determination of grain size. Imperfections		
7	point, line, surface Imperfections		
8	volume- Slip and Twinning Imperfections		
9	Necessity of alloying, types of solid solutions		
10	intermediate alloy phases, electron compounds		
11	Experimental methods of construction of equilibrium diagrams		
12	Isomorphous alloy systems, equilibrium cooling and heating of alloys		
13	Lever rule, coring miscibility gaps		
14	eutectic systems, congruent melting intermediate phases		
15	peritectic reaction. Transformations in the solid state		
16	allotropy, eutectoid, peritectoid reactions		
17	phase rule, relationship between equilibrium diagrams and properties of alloys		
18	Study of binary phase diagrams such as Cu-Ni, Fe-Fe3C		
UNIT-II Ferrous metals and alloys AND Non-ferrous Metals and Alloys **CO2:** Analyze the behavior of ferrous and non ferrous metals and alloys and their application in different domains **TB 2** - Essential of Materials science and engineering - Donald R.Askeland -Cengage			
	UNIT – 2 Ferrous metals and alloys AND N Ferrous Metals and Alloys		
19	Structure and properties of White Cast iron		

20	Structure and properties of gray Cast iron	**From: 01-03-2023 To: 18-03-2023**	Lecture interspersed with discussions, Power point Presentations
21	Structure and properties of malleable Cast iron		
22	Structure and properties of nodular Cast iron		
23	Alloy cast irons		
24	Classification of steels,		
25	structure and properties of plain carbon steels		
26	structure and properties of low carbon steels		
27	structure and properties of high carbon steels		
28	Hadfield manganese steels, tool and die steels		
29	**Non-ferrous Metals and Alloys**		
30	Structure and properties of Copper and its alloys		
31	Structure and properties of Aluminium and its alloys		
32	Structure and properties of Titanium and its alloys		
33	Structure and properties of Magnesium and its alloys, Super alloys		

UNIT-III Heat treatment of Alloys

CO3: Contrast the effect of heat treatment, addition of alloying elements on properties of ferrous metals.

TB 1 - Introduction to Physical Metallurgy - Sidney H. Avener -McGrawHill

	UNIT – 3 Heat treatment of Alloys		
34	Heat treatment of Alloys	**From: 19-03-2023 To: 13-04-2023**	Lecture interspersed with discussions, Revision Practice Tests
35	Effect of alloying elements on Fe-Fe3C system		
36	Annealing, normalizing		
37	hardening, TTT diagrams		
38	tempering, hardenability		
39	surface - hardening methods		
40	Age hardening treatment		
41	Cryogenic treatment of alloys		

UNIT-IV Powder Metallurgy

CO4: Grasp the methods of making of metal powders and applications of powder metallurgy.

TB 1 - Materials Science and engineering, Callister & Bala subrahmanyam

	UNIT –4 Powder Metallurgy		
42	Basic processes- Methods of producing metal powders	**From: 15-04-2023 To: 28-04-2023**	Lecture interspersed with discussions, Student seminar
43	milling atomization		
44	Granulation-Reduction-Electrolytic Deposition		
45	Compacting methods		
46	Sintering - Methods of manufacturing sintered parts		
47	Sintering Secondary operations-Sizing		
48	coining, machining		
49	Factors determining the use of powder metallurgy		
50	Application of this process.		

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UNIT-V **Ceramic and composite materials**

CO5: Discover the properties and applications of ceramic, composites and other advanced methods.

TB 2 Essential of Materials science and engineering - Donald R.Askeland -Cengage

	UNIT –5 Ceramic and composite materials		
51	Crystalline ceramics	**From: 29-04-2023** **To: 19-05-2023**	Lecture interspersed with discussions, Power point Presentations
52	glasses		
53	cermets		
54	abrasive materials		
55	Classification of composites		
56	various methods of component manufacture of composites		
57	particle – reinforced materials		
58	fiber reinforced materials		
59	metal ceramic mixtures		
60	metal – matrix composites		
61	C – C composites		
62	Nano-materials – definition		
63	properties and application of nano materials		

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TENTATIVE LESSON PLAN: R2022032

Course Title: DYNAMICS OF MACHINERY		**R2022032**
Section : I	**Date : 30.01.2023**	**Page No :** 01 of 03
Revision No : 00	**Prepared By : BALA CHINA LINGAM VANAM**	**Approved By : HOD**

Tools: Black board, PPTs

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I FRICTION, CLUTCHES, BRAKES & DYNAMOMETERS **CO1: To analyze the forces in clutches, brakes and dynamometers involving friction.** **TB1: Theory of Machines – S. S Rattan- TMH Publishers.** **TB2: Theory of machines / Khurmi / S.Chand.**			
1	**FRICTION:** Introduction, Inclined plane	From:30-01-2023 To: 13-02-2023	Lecture interspersed with discussions, PPT
2	Friction of screw and nuts with problems		
3	Pivot and collar, Uniform pressure, Uniform wear		
4	Friction circle & Friction axis		
5	Lubricating surfaces & Boundary friction		
6	Illustrative problems on film lubrication		
7	**CLUTCHES:** Introduction-Friction clutches		
8	Single disc (or) Plate clutch		
9	Multidisc clutch with problems		
10	Cone clutch with problems		
11	Centrifugal clutch with problems		
12	**Brakes and Dynamometers:** Introduction		
13	Simple block brakes		
14	Illustrative problems on simple block brakes		
15	Internal expanding brake with problems		
16	Band brake on vehicles with problems		
17	General description & operation of dynamometers		
18	Prony dynamometer		
19	Rope brake dynamometer with problems		
20	Epicyclic & Bevis-Gibson dynamometers with problems		

21	Bevis-Gibson dynamometers with problems		
UNIT-II STATIC AND DYNAMIC FORCE ANALYSIS **CO2: To understand the static and dynamic force analysis of four bar and slider crank mechanisms.** **TB1: Theory of Machines – S. S Rattan- TMH Publishers.** **TB2: Theory of machines / Khurmi / S.Chand.**			
22	Dynamic force analysis	From:14-02-2023 To: 04-03-2023	Lecture interspersed with discussions
23	Dynamic force analysis of four bar mechanism		
24	Dynamic force analysis of slider crank mechanism		
25	Inertia torque		
26	Angular velocity of connecting rod,		
27	Crank effort		
28	**TURNING MOMENT DIAGRAMS**		
29	Turning moment diagrams		
30	fluctuation of energy		
31	Coefficient of fluctuation of speed		
32	Fly wheel and their design with problems		
33	Fly wheel and their design & Turning moment diagrams with problems		
34	Illustrative problems on Turning moment diagram		
UNIT-III PRECESSION **CO3: Able to identify stabilization of sea vehicles, aircrafts and automobile vehicles.** **TB1: Theory of Machines – S. S Rattan- TMH Publishers.** **TB2: Theory of machines / Khurmi / S.Chand.**			
35	Introduction		
36	Dynamic force analysis of slider crank mechanism		
37	Inertia torque, angular velocity of connecting rod		
38	Acceleration of connecting rod, crank effort		
39	Turning moment diagram of fluctuation		Lecture

	of energy	From:06-03-2023 To: 20-03-2023	interspersed with discussions, student seminar
40	Coefficient of fluctuation of speed		
41	Fly wheel and their design with problems		
42	Fly wheel and their design & Turning moment diagrams with problems		
43	Illustrative problems on Turning moment diagram		
44	Introduction & Different types of governors		
45	Watt governor with problems		
46	Porter governor with problems		
47	Proell governor with problems		
48	Spring loaded governors		
49	Hartnell governor with auxiliary springs with problems		
50	Hartung governor with auxiliary springs with problems		
51	Sensitiveness, Isochronisms & Hunting		

UNIT-IV BALANCINGVIBRATIONS

CO4: Able to design balancing of reciprocating and rotary masses.

TB1: Theory of Machines – S. S Rattan- TMH Publishers.

TB2: Theory of machines / Khurmi / S.Chand.

52	Introduction	From:27-03-2023 To: 20-04-2023	Lecture interspersed with discussions
53	Balancing of rotating mass single & multiple planes		
54	Use of analytical & graphical methods		
55	Illustrative problems on single planes on rotating masses		
56	Illustrative problems on different planes on rotating masses		
57	Primary, secondary & higher balancing of reciprocating mass		

58	Analytical & Graphical methods with forces & couples diagrams		
59	Locomotive balancing		
60	Hammer blow, swaying couple & variation of tractive efforts		
UNIT-V VIBRATIONS CO5: To determine the natural frequencies of discrete system undergoing longitudinal,torsional and transverse vibrations. **TB1: Theory of Machines – S. S Rattan- TMH Publishers.** **TB2: Theory of machines / Khurmi / S.Chand.**			
61	Introduction, Types of vibrations, Free vibration of simple mass system	From:21-04-2023 To: 20-05-2023	Lecture interspersed with discussions, PPT
62	Oscillation of pendulum, centers of oscillations & suspensions, transverse loads, variation of beams with UDL		
63	Dunkerley's & Rayleigh's method		
64	Illustrative problems on Transverse loads with UDL		
65	Illustrative problems on Dunkerley's method		
66	Illustrative problems on Rayleigh's method		
67	Illustrative problems on Forced damped vibration		
68	Illustrative problems on Forced damped vibration		
68	Whirling of shafts, critical speeds		

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TENTATIVE LESSON PLAN

Course/Code: Thermal Engineering - I / R2022033

Year / Semester : II/II **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I AIR STANDARD CYCLES, ACTUAL CYCLES AND THEIR ANALYSIS **CO1: Comprehend the actual cycle from fuel-air cycle and air- standard cycle for all practical applications.** **TB 1 - "THERMAL ENGINEERING-I", PAKIRAPPA.**			
1	**Air standard Cycles:** Introduction	**From:** **30-01-2023** **To:** **16-02-2023**	Lecture interspersed with discussions
2	Otto cycle		
3	Diesel cycles		
4	Dual cycles		
5	Brayton cycle		
6	**Actual Cycles and their Analysis:** Introduction		
7	Comparison of Air Standard and Actual Cycles		
8	Time loss factor		
9	Heat loss factor		
10	Exhaust Blowdown-Loss due to Gas exchange process		
11	Volumetric efficiency		
12	Loss due to Rubbing Friction		
13	Actual and Fuel-Air Cycles of CI Engines		
14	Problems		
UNIT-II I. C. ENGINES **CO2: Discuss the working principle and various components of IC engine.** **TB 1 - "THERMAL ENGINEERING-I", PAKIRAPPA.**			
15	**I. C. Engines :** classification	**From:** **17-02-2023** **To:** **10-03-2023**	Lecture interspersed with discussions, PPT
16	Working principles		
17	Valve and Port Timing Diagrams		
18	Engine systems – Fuel		
19	Carburettor, fuel injection system		
20	Ignition, Cooling and Lubrication		
21	Principle of wankle engine		
22	Principles of supercharging		
23	Principles of turbo charging		
UNIT-III COMBUSTION IN S.I. ENGINES, COMBUSTION IN C.I. ENGINES **CO3: Interpret the combustion phenomenon of SI and CI engines and their impact on engine variables.** **TB 1 - "THERMAL ENGINEERING-I", PAKIRAPPA.**			

24	**Combustion in S.I. Engines**	**From:** **13-03-2023** **To:** **01-04-2023**	Lecture interspersed with discussions
25	Normal combustion		
26	Abnormal combustion		
27	Importance of flame speed		
28	Effect of engine variables		
29	Types of Abnormal combustion		
30	Pre-ignition and knocking		
31	Fuel requirements and fuel rating		
32	Anti knock additives		
33	Combustion chamber – requirements		
34	Types of combustion chambers		
35	**Combustion in C.I. Engines** :Four stages of combustion		
36	Delay period and its importance		
37	Effect of engine variables		
38	Diesel Knock– Need for air movement		
39	Suction, compression and combustion induced turbulence		
40	Open and divided combustion chambers and nozzles used		
41	Fuel requirements and fuel rating		
UNIT-IV	**MEASUREMENT, TESTING AND PERFORMANCE** **CO4: Analyze the performance of an IC engine based on the performance parameters.** **TB 1 - "THERMAL ENGINEERING-I", PAKIRAPPA.**		
42	Parameters of performance	**From:** **03-04-2023** **To:** **20-04-2023**	Lecture interspersed with discussions
43	Measurement of cylinder pressure		
44	Fuel consumption, air intake		
45	Exhaust gas composition		
46	Brake power		
47	Determination of frictional losses		
48	Indicated power		
UNIT-V	**GAS TURBINES, JET PROPULSION & ROCKETS** **CO5: Identify the cycles and systems of a gas turbine and determine the efficiency of gas turbine. Describe the applications and working principle of rockets and jet propulsion.** **TB 2 - "THERMAL ENGINEERING-II", PAKIRAPPA.**		
49	**GAS TURBINES:** Simple gas turbine plant	**From:** **21-04-2023**	Lecture interspersed with discussions, PPT
50	Ideal cycle, essential components		
51	Parameters of performance		
52	Actual cycle		
53	Regeneration		
54	Inter cooling and reheating		
55	Closed cycle type gas turbines		

56	**JET PROPULSION :** Principle of operation	**To:** **19-05-2023**	
57	Classification of jet propulsive engines		
58	Working principles with schematic diagrams and representation on t-s diagram		
59	Thrust, thrust power and propulsion efficiency		
60	Turbo jet engines, needs and demands met by turbo jet		
61	Schematic diagram, thermodynamic cycle		
62	Problems		
63	**Rockets:** application		
64	Working principle – classification		
65	Propellant type, thrust, propulsive efficiency		
66	Specific impulse – solid and liquid propellant rocket engines		

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TENTATIVE LESSON PLAN

Course/Code: INDUSTRIAL ENGINEERING AND MANAGEMENT / R2022034

Year / Semester: II/II **Section:** I **A.Y:** 2022-23

S. No.	TOPIC	Date	Mode of Delivery
UNIT-I INTRODUCTION **CO1:** Describe the role and responsibilities of management and the organizational structures. **TB: Industrial Engineering and Management by O. P. Khanna, Khanna Publishers.**			
1	Definition of industrial engineering (I.E), development	**From: 30/01/2023** **To: 14/02/2023**	Lecture interspersed with discussions
2	Applications, Role of an Industrial Engineer		
3	Differences Between Production Management and Industrial Engineering		
4	Quantitative Tools of IE and Productivity Measurement		
5	Quantitative Tools of IE and Productivity Measurement		
6	Concepts of Management		
7	Management Importance		
8	Functions of Management		
9	Scientific Management		
10	Taylor's Principles		
11	Theory X and Theory Y		
12	Fayol's Principles of management.		
UNIT-II PLANT LAYOUT **CO2:** Summarize the concepts of plant layout and plant maintenance. **TB: Industrial Engineering and Management by O. P. Khanna, Khanna Publishers.**			
13	Plant Location, Importance of Plant Location	**From: 16/02/2023** **To: 28/02/2023**	Lecture interspersed with discussions, Student Seminar
14	Factors governing Plant Location		
15	Types of Production Layouts		
16	Types of Production Layouts		
17	Advantages and Disadvantages of Process Layout and Product Layout		
18	Process layout and product layout applications		
19	Quantitative Techniques for Optimal Design of Layouts		
20	Quantitative Techniques for Optimal Design of Layouts		
21	Plant Maintenance, Types of Plant Maintenance		
22	Preventive and Breakdown Maintenance.		
UNIT-III OPERATIONS MANAGEMENT **CO3:** Illustrate various operations management Techniques.			

TB: Industrial Engineering and Management by O. P. Khanna, Khanna Publishers.			
23	Operations Management, Importance of Operations Management	**From: 02/03/2023 To: 28/03/2023**	Lecture interspersed with discussions, Group discussion
24	Types of Production		
25	Types of Production and their applications		
26	Work study		
27	Method study and work measurement		
28	Time study		
29	Work Sampling		
30	PMTS, Micro-Motion Study		
31	Rating Techniques		
32	MTM		
33	Work Factor System		
34	Principles of Ergonomics		
35	Process Charts and their symbols		
36	Types of process charts, flow process charts		
37	String Diagrams		
38	Therbligs		
UNIT-IV STATISTICAL QUALITY CONTROL **CO4:** Elucidate different quality control techniques. **TB: Industrial Engineering and Management by O. P. Khanna, Khanna Publishers.**			
39	Quality Control, its Importance	**From: 31/03/2023 To: 18/04/2023**	Lecture interspersed with discussions
40	Queuing assurance and its importance		
41	SQC		
42	Attribute Sampling Inspection with Single and Double Sampling		
43	Control Charts – $\bar{X}$ and R – charts		
44	Numerical Examples on X and R charts		
45	$\bar{X}$ AND S charts and their applications		
46	Numerical Examples on X and S charts		
47	TOTAL QUALITY MANAGEMENT: zero defect concept		
48	Quality Circles, Implementation		
49	Applications of quality circles		
50	ISO quality systems.		
51	Six sigma – definition, basic concepts		
UNIT-V RESOURCE MANAGEMENT **CO5:** Understand the fundamentals of effective resource management as well as the concept of value analysis. **TB: Industrial Engineering and Management by O. P. Khanna, Khanna Publishers.**			
52	Concept of Human Resource Management		

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53	Personnel Management and Industrial Relations	**From: 20/04/2023** **To: 12/05/2023**	Lecture interspersed with discussions, PPT
54	Functions of Personnel Management		
55	Job-Evaluation, Its Importance		
56	Types of Job Evaluation		
57	Merit Rating		
58	Quantitative Methods		
59	Quantitative Methods		
60	Wage Incentive Plans		
61	Types of wage incentive plans		
62	Value Engineering		
63	Implementation Procedure		
64	Enterprise Resource Planning		
65	Supply Chain Management		
66	Revision Unit – I		
67	Revision Unit – II		
68	Revision Unit – III		
69	Revision Unit – IV		
70	Revision Unit - V		

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TENTATIVE LESSON PLAN

Course/Code: Heat Transfer / R2032031

Year / Semester : III/II **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I INTRODUCTION, CONDUCTION HEAT TRANSFER, ONE DIMENSIONAL STEADY STATE CONDUCTION HEAT TRANSFER **CO1: Apply knowledge about mechanism and modes of heat transfer.** **TB: "HEAT AND MASS TRANSFER", Er R.K.RAJPUT.**			
1	Introduction to heat transfer	**From:** **09-01-2023** **To:** **04-02-2023**	Lecture interspersed with discussions
2	Modes and mechanisms of heat transfer		
3	Basic laws of heat transfer		
4	General discussion about applications of heat transfer		
5	**Conduction Heat Transfer:** Fourier rate equation		
6	General heat conduction equation in Cartesian coordinates		
7	General heat conduction equation in cylindrical coordinates		
8	General heat conduction equation in Spherical coordinates		
9	Simplification and forms of the field equation		
10	Steady & Unsteady periodic heat transfer		
11	Initial and boundary conditions		
12	**One Dimensional Steady State Conduction Heat Transfer:** Homogeneous slabs		
13	Hollow cylinders		
14	Hollow spheres		
15	Composite systems		
16	Overall heat transfer coefficient		
17	Electrical analogy		
18	Critical radius of Insulation		
19	Problems		
20	**One Dimensional Steady State Conduction Heat Transfer:** Variable Thermal conductivity		
21	Systems with heat sources		
22	Extended surface (fins) Heat Transfer		
23	Long fin		
24	Fin with insulated tip		
25	Short fin		
UNIT-II ONE DIMENSIONAL TRANSIENT CONDUCTION HEAT TRANSFER, CONVECTIVE HEAT TRANSFER			

CO2: Interpret and analyze the concepts of conduction and convective heat transfer. **TB:" HEAT AND MASS TRANSFER", Er R.K.RAJPUT.**			
26	**One Dimensional Transient Conduction Heat Transfer:** Systems with negligible internal resistance	**From:** **06-02-2023** **To:** **23-02-2023**	Lecture interspersed with discussions
27	Significance of Biot and Fourier Numbers		
28	Infinite bodies		
29	Chart solutions of transient conduction systems		
30	Concept of Semi infinite body		
31	Problems		
32	**Convective Heat Transfer:** Classification of systems based on causation of flow		
33	Dimensional analysis		
34	Buckingham Π Theorem and method		
35	Application for developing semi – empirical non-dimensional correlation for convection heat transfer		
36	Significance of non-dimensional numbers		
37	Concepts of Continuity, Momentum and Energy Equations		
38	Problems		
UNIT-III FORCED CONVECTION: EXTERNAL FLOWS, INTERNAL FLOWS , FREE CONVECTION **CO3: Interpret and analyze forced and free convection heat transfer.** **TB:" HEAT AND MASS TRANSFER", Er R.K.RAJPUT.**			
39	**Forced convection: External Flows:** Concepts about hydrodynamic boundary layer	**From:** **24-02-2023** **To:** **23-03-2023**	Lecture interspersed with discussions, PPT
40	Thermal boundary layer		
41	Use of empirical correlations for convective heat transfer		
42	Flat plates and Cylinders		
43	**Internal Flows:** Concepts about Hydrodynamic and Thermal Entry Lengths		
44	Division of internal flow		
45	Use of empirical relations for Horizontal Pipe Flow and annulus flow		
46	Problems		
47	**Free Convection:** Development of Hydrodynamic and thermal boundary layer along a vertical plate		
48	Use of empirical relations for Vertical plates and pipes		
49	Problems		
UNIT-IV HEAT TRANSFER WITH PHASE CHANGE, HEAT EXCHANGERS **CO4: Analyze the concepts of heat transfer with phase change and condensation along with heat exchangers.** **TB:" HEAT AND MASS TRANSFER", Er R.K.RAJPUT.**			
50	Pool boiling – Regimes		
51	Calculations on Nucleate boiling		
52	Critical Heat flux and Film boiling		
52	Problems		

53	Problems	**From:** **24-03-2023** **To:** **15-03-2023**	Lecture interspersed with discussions, PPT
54	**Condensation:** Film wise and drop wise condensation		
55	Nusselt's Theory of Condensation on a vertical Plate		
56	Film condensation on vertical and horizontal cylinders using empirical correlations		
57	Problems		
58	Problems		
59	**Heat Exchangers:** Classification of heat exchangers		
60	Overall heat transfer Coefficient		
61	Fouling factor		
62	Concepts of LMTD		
63	NTU methods		
64	Problems using LMTD and NTU methods.		
65	Problems using LMTD and NTU methods.		
UNIT-V RADIATION HEAT TRANSFER **CO5: Interpret the knowledge about radiation mode of heat transfer.** **TB:" HEAT AND MASS TRANSFER", Er R.K.RAJPUT.**			
66	**Radiation Heat Transfer :** Emission characteristics	**From:** **17-04-2023** **To:** **07-05-2023**	Lecture interspersed with discussions
67	Laws of black-body radiation		
68	Irradiation – total And monochromatic quantities		
69	Laws of Planck, Wien		
70	Kirchoff, Lambert, Stefan and Boltzmann		
71	Heat exchange between two black bodies		
72	Concepts of shape factor		
73	Emissivity – heat exchange between grey bodies		
74	Radiation shields		
75	Electrical analogy for radiation networks		
76	Problems		

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TENTATIVE LESSON PLAN

Course/Code: DESIGN OF MACHINE MEMBERS-II / R2032032

Year / Semester : III/II **Section:** I **A.Y:** 2022-23

S.No	TOPIC	Date	Mode of Delivery
UNIT-I BEARINGS **CO1: Identify the suitable bearing based on the application of the loads and predict the life of the bearing.** **TB1: "DESIGN OF MACHINE ELEMENTS", V.B.BHANDARI, 3rd Edition, Tata McGraw Hill Education Private Limited publications.**			
1	Classification of bearings	From: 09/01/2023 To: 02/02/2023	Lecture interspersed with discussions
2	applications. types of journal bearings		
3	lubrication — bearing modulus		
4	full and partial — clearance ratio		
5	clearance ratio , heat dissipation of bearings		
6	bearing materials		
7	Journal bearing		
8	design of ball bearings		
9	design of roller bearings		
10	static loading of ball bearings		
11	static loading of roller bearings		
12	bearing life		
13	problems		
14	Problems on bearings		
15	problems		
16	problems		
UNIT-II ENGINE PARTS **CO2: Design the IC Engines parts.** **TB1: "DESIGN OF MACHINE ELEMENTS", V.B.BHANDARI, 3rd Edition, Tata McGraw Hill Education Private Limited publications.**			
17	Connecting Rod	From: 03/02/2023 To: 21/02/2023	Lecture interspersed with discussions, PPT
18	Thrust in connecting rod		
19	stress due to whipping action on connecting rod		
20	Problems on stress due to whipping action on connecting rod		
21	cranks and crank shafts		
22	strength and proportions of over hung cranks		
23	strength and proportions of over center cranks		
24	crank pins, Crank shafts, Pistons, forces acting on piston		
25	construction design and proportions of piston, cylinder, Bore and length of cylinder		
26	Thickness of cylinder wall, Stresses in cylinder		

	wall, Cylinder head,		
27	Design of studs for cylinder head, problems, problems		
28	Pistons, piston materials, Thickness of piston head , piston ribs and cup ,Piston rings , piston barrel, skirt		
29	Piston pin , problems, problems		
UNIT-III Design of curved beams & Power Screws **CO3: Design the curved beams & power screws, calculation of stresses in curved beams and expression for radius of neutral axis for curved beams with different cross-sections.** **TB1: "DESIGN OF MACHINE ELEMENTS", V.B.BHANDARI, 3rd Edition, Tata McGraw Hill Education Private Limited publications.** **TB2: "STRENGTH OF MATERIALS", Dr. R.K. BANSAL, 4th Edition,Laxmi Publications(P) Ltd.**			
30	Design of curved beams	From: 22/02/2023 To: 31/03/2023	Lecture interspersed with discussions
31	Introduction , stresses in beams		
32	Expression for radius of neutral axis rectangular section		
33	Expression for radius of neutral axis circular section		
34	Expression for radius of neutral axis trapezoidal section		
35	Expression for radius of neutral axis t-section		
36	Design of crane hook		
37	Design of c- clamp		
38	Problems on radius of neutral axis rectangular section, circular section, trapezoidal section, t-section		
39	Problems on crane hook		
40	Problems on c- clamp		
41	DESIGN OF POWER SCREWS : Design of screw		
42	Square ACME, buttress screws, problems		
43	Design of nut, compound screw		
44	Differential screw, ball screw		
45	Possible failures, Problems		

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UNIT-IV POWER TRANSMISSIONS SYSTEMS, PULLEYS, SPUR & HELICAL GEAR DRIVES

CO4: Design the power transmission elements such as gears, belts, chains, pulleys, ropes, levers, spur & helical gear for different engineering applications.

TB1: "DESIGN OF MACHINE ELEMENTS", V.B.BHANDARI, 3rd Edition, Tata McGraw Hill Education Private Limited publications.

46	Transmission of power by belt and drives transmission efficiencies	From: 01/04/2023 To: 19/04/2023	Lecture interspersed with discussions, Group discussion
47	Belts — flat and V types		
48	Ropes ,Pulleys for belt and rope drives		
49	materials, chain drives		
50	Spur gears, Helical gears, load concentration factor, flange couplings		
51	Dynamic load factor, surface compressive strength ,bending strength,		
52	Design analysis of spur gears		
	Estimation of centre distance		
53	Module and face width		
54	check for plastic creek for dynamic wear considerations		
55	Problems		

UNIT-V MACHINE TOOL ELEMENTS

CO5: Design the Levers , brackets and Wire Ropes.

TB 1:"DESIGN OF MACHINE ELEMENTS", V.B.BHANDARI, 3rd Edition, Tata McGraw Hill Education Private Limited publications.

56	Levers and brackets: design of levers	From: 20/04/2023 To: 06/05/2023	Lecture interspersed with discussions
57	Hand lever , foot lever ,cranked lever		
58	Lever of a lever loaded safety valve		
59	Rocker arm straight, Angular, design of a crank pin		
60	Brackets, hangers, wall boxes		
61	Wire Ropes Construction		
62	Designation, Stresses in wire ropes		
63	Rope sheaves and drums		
64	Problems		
65	Problems		

TB1:"DESIGN OF MACHINE ELEMENTS", V.B.BHANDARI, 3rd Edition, Tata McGraw Hill Education Private Limited publications.

TB2: "STRENGTH OF MATERIALS", Dr. R.K. BANSAL, 4th Edition,Laxmi Publications(P) Ltd.

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DEPARTMENT OF MECHANICAL ENGINEERING

TENTATIVE LESSON PLAN: R2032033 INTRODUCTION TO ARTIFICIAL INTELLIGENCE&MACHINE LEARNING

Course Title: INTRODUCTION TO ARTIFICIAL INTELLIGENCE&MACHINE LEARNING		Course code: R2032033	
Date :01/08/2022		Page No : 01 to 04	
Revision No : 00	Prepared By: Dr.A.STANLY KUMAR	Approved By : HOD	
Tools: BLACK BOARD, PPTs			

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I INTRODUCTION,NEURAL NETWORKS AND GENETIC ALGORITHM **CO1: Discuss basic concepts of artificial intelligence,neural networks andgenetic algorithm** **TB 1 : Stuart Russel and Peter Norwig,Artificial Intelligence: A Modern Approach 2/e,Pearson Education,2010**			
1	Definition of Artificial Intelligence	From: 01/08/2022 To: 20/08/2022	Lecture interspersed with discussions, Student Seminar
2	Evolution		
3	Need and applicatons in real world		
4	Intelligent agents		
5	Agents and Environments		
6	Good Behavior		
7	The concpt of rationality		
8	The nature of Environments		
9	Structure of Agents		
10	Neural Networks and Genetic Algorithm		
11	Neurla network representation		
12	Problems		
13	Perceptions		
14	Multilayer networks		
15	Back propagation algorithms		
16	Genetic algorithms		
UNIT-II KNOWLEDGE-REPRESENTATION AND REASONING **CO2: Apply the principles of knowledge representation and reasoning.** **TB 1 : Stuart Russel and Peter Norwig,Artificial Intelligence: A Modern Approach 2/e,Pearson Education,2010**			
17	Knowledge based agents		
18	The Wumpus worls		
19	Logic		
20	Patterns in Propositional Logic		
21	Inference in First-Order Logic - Propositional Vs First order inference		
22	Unification and lifting		
UNIT-III BAYESIAN AND COMPUTATIONAL LEARNING			

CO3: Learn about bayesian and computational learning and machine learning. **TB 2: Tom M.Mitchel,Machine Learning,McGraw Hill,2013..,**			
23	Bayes theorm	From: 13/09/2022 To: 17/10/2022	Lecture interspersed with discussions
24	Concept Learning		
25	Maximum likelihood		
26	Minimum description length principle		
27	Gibbs Algorithm		
28	Naive Bayes Classifier		
29	Instance Based Learning		
30	K-Nearest neighbour learning		
31	Introduction to Machine Learning		
32	Definition		
33	Evlution		
34	Need,Applicatons of ML in industry		
35	And real world		
36	Classification		
37	Diffrences between supervised and unsupervised learning paradigms.		
UNIT-IV BASIC METHODS IN SUPERVOSED LEARNING **CO4: Utilize various machine learning techniques.** **TB 2: Tom M.Mitchel,Machine Learning,McGraw Hill,2013.**			
38	Distance based methods	From: 18/10/2022 To: 07/11/2022	Lecture interspersed with discussions, PPT
39	Nearest -Neighbors		
40	Decision Trees		
41	Support Vector Machines		
42	Nonlinearity and Kernel Methods		
43	**Unsupervised Learning**		
44	Clustering		
45	K-means		
46	Dimensionality Reduction		
47	PCA and Kernel.		
UNIT-V MACHINE LEARNING ALGORITHM ANALYTICS **CO5: Apply the machine learning analytics and deep learning techniques.** **TB 2: Tom M.Mitchel,Machine Learning,McGraw Hill,2013.**			
48	Evaluating Machine Learning algorithms	From:	Lecture interspersed
49	Model Selection		
50	Ensemble Methods(Boosting,Bagging, and Random Forests)		

51	Modeling Sequence/Time-Series Data and Deep Learning	09/11/2022 To: 26/11/2022	with discussions, Group discussion
52	Deep generative models		
53	Deep Boltzmann Machines		
54	Deep auto encoders		
55	Applications of Deep Networks		

TB 1 : Stuart Russel and Peter Norwig,Artificial Intelligence: A Modern Approach 2/e,Pearson Education,2010.
TB 2: Tom M.Mitchel,Machine Learning,McGraw Hill,2013.

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TENTATIVE LESSION PLAN: R203203A

Course Title: AUTOMOBILE ENGINEERING			**Course code: R203203A**
Section: Sec B	**Date: 09-01-2023**		**Page No:** 01 to 03
Revision No: 00	**Prepared By: BALA CHINALINGAM VANAM**		**Approved By: HOD**
Tools: BLACK BOARD			
No. of Periods	**TOPIC**	**Date**	**Mode of Delivery**
UNIT-I	**INTRODUCTION, STEERING SYSTEM**		
CO1: Able to understand basics of automobile engineering & their applications			
TB: "AUTOMOBILE ENGINEERING", Er KIRPAL SINGH.			
	UNIT-1: Introduction	09-01-23 TO 21-01-23	Lecture interspersed with discussions
1	Introduction: Components of four-wheeler automobile- Chassis & body		
2	Power unit- Power transmission		
3	Rear wheel drive, Front wheel drive & Four-wheel drive		
4	Types of Automobile Engines & Construction		
5	Turbo charging & Super charging		
6	Engine Lubrication system, Splash & Pressure lubrication system		
7	Oil filters & oil pumps		
8	Crankcase ventilation		
9	Engine service & reboring		
10	Decarbonization		
11	Nitriding of crankshaft		
UNIT-II	**TRANSMISSION SYSTEM**		
CO2: Gain knowledge & become familiar with the functions of transmission system of an automobile & it's uses			
TB: "AUTOMOBILE ENGINEERING", Er R.K. GOVINDAN.			
	UNIT – 2: Transmission system	23-01-23 TO 10-02-23	Lecture interspersed with discussions, PPT
12	Transmission system & Types of clutches		
13	Cone clutch, single plate clutch & multi-plate clutch		
14	Magnetic & centrifugal clutches		
15	Fluid fly-wheel & types of gear boxes		
16	Sliding mesh & construct mesh gear box		
17	Synchro mesh & Epicyclic gear box		
18	Overdrive torque convertor		
19	Propeller shaft & Hotch kiss drive		
20	Torque tube drive		
21	Universal joint		
22	Differential rear axles types		
23	Types of wheels & tires		
UNIT-III	**SUSPENSION SYSTEM, BRAKING SYSTEM**		

CO3: Able to understand fundamentals of Steering system in an automobile & its functions **TB: "AUTOMOBILE ENGINEERING", Er R.K. GOVINDAN.**			
	UNIT – 3: Steering system	13-02-23 TO 25-02-23	Lecture interspersed with discussions
24	Steering system introduction & steering geometry		
25	Camber & caster angle		
26	King-pin rake angle		
27	Combined angle toe-in & toe-out		
28	Center point steering		
29	Types of steering mechanisms		
30	Ackermann steering mechanism		
31	Types of steering gears		
32	Types of steering linkages		
UNIT-IV ENGINE SPECIFICATION AND SAFETY SYSTEMS & ELECTRICAL SYSTEM **CO4: Able to understand fundamentals of suspension, braking & electrical systems & their functions & uses** **TB:" AUTOMOBILE ENGINEERING", Er R.K. GOVINDAN.**			
	UNIT – 4 Suspension system, Braking system & Electrical system	27-02-23 TO 09-03-23	Lecture interspersed with discussions, student seminar
	Suspension system		
33	Suspension system introduction		
34	Objects of suspension system		
35	Rigid axle suspension system		
36	Torsion bar & Shock absorber		
37	Independent suspension systems		
	Braking system		
38	Braking system introduction & types of braking systems		
39	Mechanical brake system & Hydraulic brake system		
40	Master cylinder, wheel cylinder & tandem master cylinder		
41	Requirement of brake fluid brakes		
42	Pneumatic & vacuum brakes		
	Electrical system		
43	Electrical system & types of circuits		
44	Charging circuit, generator & current		
45	Voltage regulator & starting system		
46	Bendix drive mechanism		
47	Solenoid switch & lighting system		
48	Horns, Wiper & Fuel guage		
49	Oil pressure guage		
50	Engine temperature indicator system		

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UNIT-V ENGINE EMISSION CONTROL, ENGINE SERVICE

CO5: Gain knowledge & become familiar with the Engine specification & their safety systems of an automobile

TB: "AUTOMOBILE ENGINEERING", Er R.K. GOVINDAN.

	UNIT – 5 Engine specification & safety systems		
51	Engine specification & safety systems with regard to power	11-03-23 TO 28-03-23	Lecture interspersed with discussions
52	Safety system with regard to speed, torque & no of cylinders		
53	Arrangement, lubrication & cooling		
54	Safety introduction & Types safety systems		
55	Seat belt construction		
56	Air bags types & Bumper		
57	Anti-lock braking systems (ABS)		
58	Wind shield		
59	Suspension sensors & traction control		
60	Mirrors & central locking		
61	effluents from power plants		
62	Electric windows		
63	Speed control in safety sytems		
64	Engine emission control introduction		
65	Types of pollutants		
66	Mechanism of formation		
67	Concentration measurement		
68	Methods of controlling engine modification		
69	Exhaust gas treatment		
70	Thermal & Catalytic convertors		
71	Use of alternative fuels for Emission control		
72	National & International pollution standards		
73	Engine Service introduction		
74	Service details of engine cylinder head		
75	Valves & Valve Mechanism		
76	Piston connecting rod assembly		
77	Cylinder block & crankshaft		
78	Main bearings service		
79	Engine re-assembly precautions		

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TENTATIVE LESSON PLAN: R194203A
ADDITIVE MANUFACTURING

Course Title: Additive Manufacturing		**Course Code: R194203A**
Date: 05/12/2022		**Page No:** 01 of 03
Revision No: 00	**Prepared By :P. Bhagya Lakshmi**	**Approved By: HOD**

Tools: Black board, PPT's, Seminars, Group Discussions e.t.c

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I INTRODUCTION, LIQUID-BASED RAPID PROTOTYPING SYSTEMS **CO1: Make use of SLA, SGC for manufacturing of complex components** **TB: Rapid prototyping: Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific publications**			
1	**INTRODUCTION**: Prototyping fundamentals	From: 05/12/22 To: 24/12/22	Lecture interspersed with discussions, PPT
2	historical development		
3	fundamentals of rapid prototyping		
4	advantages and limitations of rapid prototyping		
5	Commonly used terms, classification of RP process		
6	**LIQUID-BASED RAPID PROTOTYPING SYSTEMS**: Stereo lithography Apparatus (SLA): models and specifications		
7	process, working principle		
8	photopolymers, photo polymerization		
9	layering technology, laser and laser scanning.		
10	applications, advantages and disadvantages		
11	case studies		
12	Solid Ground Curing (SGC): models and specifications		
13	process, working principle		
14	applications, advantages and disadvantages		
15	case studies		
UNIT-II SOLID-BASED RAPID PROTOTYPING SYSTEMS **CO2: Identify the use of LOM, FDM for manufacturing of complex components** **TB: Rapid prototyping: Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific publications**			
16	Laminated object manufacturing (LOM) - models and specifications		
17	process, working principle		
18	applications, advantages and disadvantages		

19	case studies	From: 26/12/22 To: 10/01/23	Lecture interspersed with discussions, Student Seminar
20	Fused deposition modelling (FDM) - models and specifications		
21	process, working principle		
22	applications, advantages and disadvantages		
23	case studies		
UUNIT-III POWDER BASED RAPID PROTOTYPING SYSTEMS **CO3: Apply SLS, 3DP for manufacturing of complex components** **TB: Rapid prototyping: Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific publications**			
24	Selective laser sintering (SLS): models and specifications	From: 11/01/23 To: 28/01/23	Lecture interspersed with discussions, Student Seminar
25	process, working principle		
26	applications, advantages and disadvantages		
27	case studies		
28	three-dimensional printing (3DP): models and specifications		
29	process, working principle		
30	applications, advantages and disadvantages		
31	case studies		
UNIT-IV RAPID TOOLING **CO4: Choose the correct Rapid tooling process for prototype development** **TB: Rapid prototyping: Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific publications** **R1- Wohlers Report 2000 /Terry T Wohlers/Wohlers Associates**			
32	**RAPID TOOLING:** Introduction to rapid tooling (RT), conventional tooling Vs RT	From: 06/02/23 To: 04/03/23	Lecture interspersed with discussions, PPT
33	Need for RT, rapid tooling classification		
34	indirect rapid tooling methods: RTV epoxy tools, spray metal deposition		
35	Ceramic tools, investment casting		
36	spin casting, die casting		
37	sand casting		
38	3D Keltool process		
39	Direct rapid tooling: direct AIM		
40	LOM Tools, DTM Rapid Tool Process		
41	EOS Direct Tool Process		

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42	Direct Metal Tooling using 3DP		

UNIT-V RAPID PROTOTYPING DATA FORMATS,

CO5: Utilize additive manufacturing techniques in various industries and fields like jewelry , coin, architecture e.t.c

TB: Rapid prototyping: Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific publications

R1- Wohlers Report 2000 /Terry T Wohlers/Wohlers Associates

43	**RAPID PROTOTYPING DATA FORMATS:** STL Format	From: 06/03/23 To: 01/04/23	Lecture interspersed with discussions, Group Discussion
44	STL File Problems		
45	consequence of building valid and invalid tessellated models		
46	STL file Repairs: Generic Solution		
47	other Translators		
48	Newly Proposed Formats		
49	**RP APPLICATIONS:** Application in engineering, analysis and planning		
50	aerospace industry		
51	automotive industry		
52	jewelry industry		
53	coin industry		
54	GIS application, arts and architecture		
55	RP medical and bioengineering applications: planning and simulation of complex surgery		
56	customized implants & prosthesis		
57	design and production of medical devices		
58	forensic science		
59	anthropology		
60	visualization of bimolecular		

TB: Rapid prototyping: Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific publications

R1- Wohlers Report 2000 /Terry T Wohlers/Wohlers Associates

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TENTATIVE LESSON PLAN: R194205F
IMAGE PROCESSING

Course Title: IMAGE PROCESSING		Course code: R194205F	
Date :01/08/2022		Page No : 01 to 04	
Revision No : 00	Prepared By: Dr.A.STANLY KUMAR	Approved By : HOD	
Tools: BLACK BOARD, PPTs			

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I DIGITAL IMAGE FUNDAMENTALS **CO1: Know and understand the basics and fundamentals of digital image processing** **TB 1 : Rafael C Gonzalez.Richard E.Woods,Digital Image Processing.Pearson,Third Edition,2010**			
1	Digital Image Fundamentals	From: 01/08/2022 To: 20/08/2022	Lecture interspersed with discussions, Student Seminar
2	Steps in Digital Image Processing		
3	Components		
4	Elements of Visual Perception		
5	Image Sensing and Acquit ion		
6	Image Sampling		
7	Quantization		
8	Relationships between pixels		
UNIT-II IMAGE ENHANCEMENT **CO2: Operate on imagesusing the techniwues of smoothing,sharpening and enchancement.** **TB 1 : Rafael C Gonzalez.Richard E.Woods,Digital Image Processing.Pearson,Third Edition,2010**			
9	Image Enhancement	From: 22/08/2022 To: 12/09/2022	Lecture interspersed with discussions, Blended learning
10	Spatial Domain		
11	Gray level transformation		
12	Histogram Processing		
13	Basics of Spatial Filtering		
14	Smoothing		
15	Sharpening Spatial Filtering		
16	Frequency Domain		
17	Introduction to Fourier Transform		
18	Smoothing and Sharpening		
19	Frequency Domain Filtering		
20	Ideal,Butterworth and Gaussian Filters		
21	Homomorphic Filtering		
UNIT-III IMAGE RESTORATION **CO3: Use the restoration concepts and filtering tehniques.**			

TB 1 : Rafael C Gonzalez.Richard E.Woods,Digital Image Processing.Pearson,Third Edition,2010			
22	Image Restoration	From: 13/09/2022 To: 17/10/2022	Lecture interspersed with discussions
23	Degrdation model		
24	Properties		
25	Noise models		
26	Mean Filters		
27	Order Statistics		
28	Adsaptive Filters		
29	Band Reject Filters		
30	Band Pass Filters		
31	Notch Filters		
32	Optimum Notch Filtering		
33	Inverse Filtering		
34	Weiner Filtering		
UNIT-IV IMAGE SEGMENTATION **CO4: Illustrate the basics of segmentation** **TB 1 : : Rafael C Gonzalez.Richard E.Woods,Digital Image Processing.Pearson,Third Edition,2010**			
35	Image Segmentation	From: 18/10/2022 To: 07/11/2022	Lecture interspersed with discussions, PPT
36	Edge Detection		
37	Edge linking via Hough transform		
38	Thresholding		
39	Region based segmentation		
40	Region growing		
41	Region Splitting		
42	Region Merging		
43	Morphological Processing		
44	Erosion and Dialation		
45	Segmentation by morphological watersheds		
46	Basic Concepts		
47	Dam Construction		
48	Watershed segmentation algorithm		
UNIT-V IMAGE COMPRESSION AND RECOGNITION **CO5: Understand Image Compression and Recognition techniques.** **TB 1 : Rafael C Gonzalez.Richard E.Woods,Digital Image Processing.Pearson,Third Edition,2010**			
49	Need for data compression	From: 09/11/2022 To:	Lecture interspersed with discussions,
50	Huffman		
51	Run length encoding		
52	Shift Codes		
53	Arithmatic Coding		
54	JPEG standard		

55	MPEG	26/11/2022	Group discussion
56	Boundary representation		
57	Boundary description		
58	Fourier Descriptors		
59	Regional Descriptors		
60	Topological feature		
61	Texture-Pattern		
62	Pattern Classes		
63	Recognition based on matching		

TB 1 : Rafael C Gonzalez.Richard E.Woods,Digital Image Processing.Pearson,Third Edition,2010

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TENTATIVE LESSON PLAN

Course/Code: WASTE WATER TREATMENT / R194201U

Year / Semester : IV/II **Section:** I **A.Y:** 2022-23

S.No	TOPIC	Implemented Date	Mode of Delivery
UNIT –I INDUSTRIAL WATER QUANTITY AND QUALITY REQUIREMENTS **CO1: Analyze the quality and quantity of water for various industries and Advanced water treatment methods.** **TB: Industrial Waste water Treatment by KVSG Murali Krishna, Paramount Publishers, Visakhapatnam, 2019.**			
1.	Industrial water quantity and quality requirements:	From: 05/12/2022 To: 28/12/2022	Lecture interspersed with discussions, Student Seminar
2.	Boiler, Cooling, Domestic / Canteen and process		
3.	Waters for Textiles, Dairy industry		
4.	Food processing,		
5.	Aqua industry,		
6.	sugar mills,		
7.	Brewery and distillery Industries		
8.	Fertilizer industry, Power plants		
9.	Advanced water treatment		
10.	Reverse Osmosis, Adsorption		
11.	Ultra filtration, Ion Exchange		
12.	Elutriation, Freezing		
13.	Removal of Iron and manganese,		
14.	Removal of Color and Odour.		
15.	Use of Municipal wastewater in Industries.		
UNIT –II BASIC THEORIES OF INDUSTRIAL WASTE WATER MANAGEMENT **CO2 : Identify the common methods of treatment of wastewaters and Biological treatment methods.** **TB: Industrial Waste water Treatment by KVSG Murali Krishna, Paramount Publishers, Visakhapatnam, 2019.**			
16.	Basic theories of Industrial Waste water management	From: 30/12/2022 To: 10/01/2023	Lecture interspersed with discussions
17.	Industrial waste survey		
18.	Measurement of industrial waste water		
19.	Flow – generation rates		
20.	Industrial waste water sampling and preservation of samples for analysis		
21.	Waste water characterization		
22.	Toxicity of industrial effluents		
23.	Common methods of treatment of waste waters		
24.	Unit operation and processes, Volume and Strength reduction		
25.	Neutralization, Equalization and proportioning		
26.	Recycling, reuse and resources recovery		

27.	Miscellaneous Treatment: Biological treatment of sewage		
28.	Primary, and Tertiary treatment of sewage.		

UNIT –III INDUSTRIAL WASTEWATER DISPOSAL MANAGEMENT

CO3 : Identify the methods to reduce impacts of disposal of wasters into environment and CETPs.

TB: Industrial Waste water Treatment by KVSG Murali Krishna, Paramount Publishers, Visakhapatnam, 2019.

29.	Industrial wastewater disposal management:	From: 14/01/2023 To: 15/02/2023	Lecture interspersed with discussions, PPT
30.	Discharges into Sewers, Streams- Oxygen sag curve,		
31.	Lakes-eutrophication and oceans and associated problems, Land treatment		
32.	sewage sickness, Common Effluent Treatment Plants		
33.	advantages and suitability,		
34.	Limitations and challenges		
35.	Recirculation of Industrial Wastewaters		
36.	Effluent Disposal Method.		

UNIT –IV PROCESS AND TREATMENT OF SPECIFIC INDUSTRIES-1

CO4 : Identify the methods of treatment of wastewaters from specific industries like steel plants, refineries, and power plants, that imply biological treatment methods.

TB: Industrial Waste water Treatment by KVSG Murali Krishna, Paramount Publishers, Visakhapatnam, 2019.

37.	Process and Treatment of specific Industries-1	From: 16/02/2023 To: 07/03/2023	Lecture interspersed with discussions
38.	Manufacturing Process and origin,		
39.	characteristics,		
40.	effects and treatment methods of liquid waste from Steel plants		
41.	Fertilizers		
42.	Textiles		
43.	Paper & Pulp industries,		
44.	Oil Refineries		
45.	Coal and Gas based Power Plants.		
46.	Case studies		

UNIT – V PROCESS AND TREATMENT OF SPECIFIC INDUSTRIES-2

CO5 : Identify the methods of treatment of wastewaters from industries like Aqua, dairy, sugar plants, and distilleries that imply biological treatment methods.

TB: Industrial Waste water Treatment by KVSG Murali Krishna, Paramount Publishers, Visakhapatnam, 2019.

47.	Process and Treatment of specific Industries-2		
48.	Manufacturing Process and origin,		
49.	characteristics,		

50.	effects and treatment methods of liquid waste from Tanneries,	From: 07/03/2023 To: 31/03/2023	Lecture interspersed with discussions, PPT
51.	Sugar Mills		
52.	Distillers		
53.	Dairy Processing industries		
54.	Food Processing industries		
55.	Aqua industry		
56.	Pharmaceutical Plants, Case studies		
57.	Case studies		
58.	Old question papers		
59.	Old question papers		

TB: Industrial Waste water Treatment by KVSG Murali Krishna, Paramount Publishers, Visakhapatnam, 2019.

Signature of the Faculty

Signature of the HoD